The following candidates were proposed for election as Fellows of the Society, the names of the proposers from personal knowledge being appended:—

Thomas Richard Clapham, Gentleman, Austwick Hall, near Settle, Yorkshire (proposed by Herbert Sadler);

Arthur Kennedy, Solicitor, 1 Clement's Inn, W.C. (proposed by J. E. Drower).

Fifty-eight presents were announced as having been received since the last meeting, including, among others:

Annals of Harvard College Observatory, vol. xxiv (Results of Observations with the Meridian Photometer, 1882–86); presented by the Observatory.

Annalen der Sternwarte in Leiden, Band V. (containing Zone Observations 29° 50′ to 35° 10′); presented by the Observatory.

Collected Scientific Papers of James Clerk Maxwell, 2 vols.; presented by the Clerk Maxwell Memorial Committee.

MS. Observations of Shooting Stars, 1873–89, by W. F. Denning; presented by the Author.

Bichromate Battery and Ruhmkorff Coil, presented by Mr. J. E. H. Peyton.

Remarks on Mr. Fowler's Note on the Duplicity of α Lyræ. By Professor H. C. Vogel, Foreign Associate.

In the last number of the *Monthly Notices* (vol. li. p. 8) Professor Lockyer communicated some photographic observations of stellar spectra made at South Kensington by Mr. Fowler, from which the duplicity of *α Lyræ* was concluded. Mr. Fowler would certainly have to be felicitated if at the very outset of his work on photographic spectra he had indeed succeeded in making a discovery of such great interest; but at present, for reasons which I beg to lay before the Society, it seems to me that his conclusions from his observations can scarcely be accepted without independent confirmation.

I think it will be of interest for me to communicate the results of photographic observations of *α Lyræ* made at Potsdam during the years 1888 to 1890.

These observations are:—

1. 1888, September 28.—Exp. 35^{m}. Many lines, definition very sharp, no trace of double lines.

2. 1888, November 11.—8^{h} 0^{m}, Potsdam mean time. Exp. 60^{m}. Beautiful photograph, a great number of lines, all lines very sharp; no duplication indicated.

3. 1888, November 13.—7^{h} 15^{m}, Potsdam mean time. Exp. 70^{m}. An extremely sharp photograph containing a great number of well-defined lines. No double lines.

4. 1889, May 31.—$10^h\ 30^m$, Potsdam mean time. Exp. 60^m. Good photograph, many lines, extremely sharp.

5. 1889, June 6.—$10^h\ 15^m$, Potsdam mean time. Exp. 30^m. Good photograph, many lines, extremely sharp.

6. 1889, September 15.—$10^h\ 5^m$, Potsdam mean time. Exp. 30^m. Good photograph, many lines, very sharp.

7. 1889, November 24.—$6^h\ 40^m$, Potsdam mean time. Exp. 30^m. Good photograph, sharp lines.

8. 1890, November 25.—$5^h\ 58^m$, Potsdam mean time. Exp. 45^m. Good photograph, only few lines visible, but very sharp.

9. 1890, November 25.—$10^h\ 45^m$, Potsdam mean time. Exp. 40^m. Photograph faint. Star near the horizon. Magnesium line (wave-length 448·14 $\mu\mu$) sharp and not doubled.

10. 1890, November 26.—$8^h\ 43^m$, Potsdam mean time. Exp. 45^m. Spectrum not very good on account of the low temperature. Nevertheless lines sufficiently sharp and certainly no trace of duplication.

Mr. Fowler deduces from his observations of *a Lyræ* a relative velocity of the component stars of about 370 miles per second, in a nearly circular orbit, with a period of about 24·68 hours. From these data it is easy to see that, during 23·83 hours, in every revolution of the stars in their orbit the lines must be separated by a distance corresponding to a relative motion of more than 20 miles. I state this as a lower limit, on the supposition that a separation of the lines cannot be seen when the relative motion is less than 20 miles; nevertheless, I am sure that the sharp definition of the lines in the photographs taken with the Potsdam spectrograph would permit a separation due to a very much smaller relative motion to be easily detected.

I beg to draw attention at first to the three Potsdam observations of 1890, which are in direct opposition to Mr. Fowler's results. Suggesting that if at one of these observations the lines were absolutely single, it is to be expected, accepting Mr. Fowler's period, that they would be separated in both the other observations; and especially in the second photograph taken on November 25, after an interval of five hours, nearly a maximum of separation must occur.

On Mr. Fowler's data it would rarely happen for the lines to be seen single, as Mr. Fowler himself points out: "The doubling of the line takes place so quickly that it is difficult to say when it is absolutely single." With a period of 24·68 hours, twice only during that interval for the very short time of 0·43 hours would the lines be narrow enough to appear single on the limit of separation suggested above—that is to say, at a distance corresponding to a relative motion not greater than 20 miles per second.

No calculation is needed to show how exceedingly small is the probability that all the Potsdam observations in 1888 and

1889 happened to be made precisely at the very times of these short minima. But there is another consideration which is even more crucial, arising from the great velocity with which the lines would begin to separate after the moments of complete coincidence. Now the average length of exposure given at Potsdam was 45 minutes. On Mr. Fowler's data, it is clear that it would have been absolutely impossible to have obtained the lines sharply defined with so prolonged an exposure. It is certain that the lines would have come out upon the plates very diffused through a breadth corresponding to a relative motion of about 50 miles; but, on the contrary, all the lines in the photographs of α *Lyræ* are well defined and sharply single.

In the Potsdam spectrograph a small part only of the spectrum is photographed in the neighbourhood of the Hγ-line, from about λ 420 $\mu\mu$ to λ 460 $\mu\mu$, and consequently the K-line, the duplicity of which Mr. Fowler observed, is not included in our photographs. Though Mr. Fowler says that other fine lines seen in his photographs were also "seen to be double in two or three photographs," yet possibly the objection might be raised that the spectra of the component stars of α *Lyræ* had only the hydrogen lines and K in common. The answer is that no relative displacement of the lines in the superposed spectra of the two component stars has occurred. A measurement of a group of the following lines on all the photographs: 446·88, 448·14 (magnesium-line), 452·30, 453·43, and 454·99 $\mu\mu$ showed no displacement greater than $\pm$ 5 miles.

Another objection might be urged in opposition to the evidence from the Potsdam photographs, based on the supposition that the fine lines in the part of the spectrum which they contain are all due to the spectrum of one only of the two component stars. This objection is completely met by the measures of the magnesium-line (448·14 $\mu\mu$) and of two lines near the Hγ-line (432·62 and 435·22 $\mu\mu$), which show that no displacement of any importance can be detected relatively to the terrestrial hydrogen-line simultaneously photographed on the plate. If Mr. Fowler's observations were correct, alterations in the positions of these fine lines, even if due to one component star only, should occur, corresponding to velocities up to 185 miles per second. Apart from the measures, which show that no such displacement took place, it is clear that, on this supposition of the motion of one star only showing on the plate, all the lines would be hazy and broad during an exposure prolonged through three-quarters of an hour.

I may add that all the lines in the part of the spectrum which is shown by the Potsdam photographs in the case of β *Aurigæ* are found to double periodically, and it is by no means difficult to measure the duplicity. On 1890, November 25, 9^h 43^m Potsdam mean time, I measured the separation of some lines in this star, which lines are also present in the spectrum of α *Lyræ*, and determined from them the relative motion of the two components forming the binary star β *Aurigæ*, as follows:—

W.L.	Miles.
448·14	136
449·16	128
450·15	127
453·43	133
454·99	134

I am sorry to have to say that the foregoing observations of *α Lyræ* made at Potsdam cannot be reconciled with Mr. Fowler's observations and the conclusions he draws from them.

It is not for me to suggest the possible causes which have led to the double lines which Mr. Fowler occasionally finds on his photographs of *α Lyræ.* Without great care and a special knowledge of the particular drawbacks to which the arrangement is liable, it is by no means unlikely for photographs taken with prisms over the object-glass to show occasionally a duplication or even a triplication of the lines in the spectrum of a star.

In the case of the Potsdam instrument, in which a slit is used, the possibility of getting double lines which are not due to real motions of the components of a close double star is practically excluded.

I hope Mr. Fowler will allow me to suggest to him to test his instrument and his method of working, by taking, in the first place, photographs of the spectrum of *β Aurigæ*, the motions of which are already known. Further, it would be well if he followed Professor Pickering's example in employing a greater dispersive power. The observations taken at Potsdam are with a dispersion still greater even than that used by Pickering.

I beg, in conclusion, to draw attention to the calculation and to the diagram given in Mr. Fowler's paper, as they fall far short of the accuracy which may be justly looked for in so important a statement. November 1, 8^h may be taken as the time of a zero point, because the following observations of this day show a regular increase in some way, and then calculation shows, with the given period of 24·68 hours, the following results:—

		h	Calculated Motion.	Observation.	C.—O.
Oct.	3	9·00	313 miles.	180 miles.	+133
	8	8·00	314 ,,	370 ,,	− 56
	9	7·00	204 ,,	232 ,,	− 28
	10	7·33	176 ,,	260 ,,	− 84
	11	8·50	215 ,,	218 ,,	− 3
	12	8·25	139 ,,	294 ,,	−155
	14	10·00	172 ,,	260 ,,	− 88
	17	10·00	13 ,,	0 ,,	+ 13
	27	8·00	282 ,,	109 ,,	+173
	28	6·50	113 ,,	0 ,,	+113
Nov.	1	8·00	0 ,,	0 ,,	0
	1	8·50	47 ,,	109 ,,	− 62
	1	10·00	180 ,,	180 ,,	0
	4	9·00	97 ,,	0 ,,	+ 97

An alteration of the zero point of ± half an hour, equal to about 50 miles, does not produce any remarkable improvement; and I doubt greatly whether, from a scientific point of view, any reasonable accordance between calculation and observation could in any way be made out.

The Proper Motion of H 1968. By S. W. Burnham.

The double star *H* 1968 was first noted by Sir John Herschel with the 20-foot reflector at Slough, and entered in his Fifth Catalogue, published in 1833 (*Memoirs R.A.S.*, vol. vi.) The position-angle was measured and given as 61°·3, the distance being estimated as 20″±, and the magnitudes called 8 and 10–11. Naturally a pair of this class would not attract much attention, and, so far as I know, it was never looked at or referred to by anyone for nearly half a century following. During the several years in which I was using the 6-inch Clark telescope at Chicago, I looked up hundreds of double stars to fix their places by identifying them in some of the star catalogues, to correct various apparent errors in magnitudes, descriptions, &c., and for other purposes, and among others examined the pair in question in December 1875. The apparent change since Herschel's observation, particularly in distance, was very striking, and could not come from any ordinary error in the early description. I called the attention of Baron Dembowski to the probable change which had taken place, and he made a set of measures in 1876 and 1877, which will be found on page 347 of vol. i. of his observations. The name of the star is not given. Subsequently this pair was measured at Cincinnati, and still later by me with the 18½-inch refractor of the Dearborn Observatory. I have lately finished a series of measures at this observatory. So far as I know, these are all the measures that have been made anywhere. They are as follows:—

1831	61°·3	20″±	8	10–11	H	1*n*
1877·23	73·1	8·50	7·1	10·0	De	4*n*
1879·87	71·9	7·46	...	...	Cin	2*n*
1880·09	73·6	6·94	...	...	β	3*n*
1890·86	87·8	3·98	7·5	9·7	β	4*n*

These measures should be sufficient to determine the character of the motion. We have no means of ascertaining the exact time when Herschel measured the angle; but as he states the observations of the stars comprised in his Fifth Catalogue were made in the years 1830 and 1831, I have assumed 1831·0 as the most probable date, and that is near enough for the purposes of this investigation.